

# FCC Maximum Permissible RF Exposure (MPE) Estimation Report

**In accordance with the requirements of**  
**FCC 47 CFR Part 2(2.1091), FCC 47 CFR Part 2(2.1093) and**  
**KDB 447498 D01**

**Product Name:** ConBox2020RD

**Trademark:** Lear

**Model Name:** CB20RDNAR1

**Serial Model:** N/A

**Report No.:** S24080903001008

**FCC ID:** 2BK8UCB20RDNAR1

**Prepared for**

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## TEST RESULT CERTIFICATION

**Applicant's name** ..... : Lear Corporation Engineering GmbH

Address ..... : Industriestrasse 48, Kronach, Germany, 96317

**Manufacturer's Name** ..... : Lear Corporation Engineering GmbH

Address ..... : Industriestrasse 48, Kronach, Germany, 96317

### Product description

Product name ..... : ConBox2020RD

Trademark ..... : Lear

Model and/or type reference : CB20RDNAR1

Serial Model..... : N/A

FCC 47 CFR Part 1(1.1310)

FCC 47 CFR Part 2(2.1091)

**Standards** ..... : FCC 47 CFR Part 2(2.1093)

KDB 447498 D01

This device described above has been tested by Shenzhen NTEK. Testing has shown that this device is capable of compliance with MPE specified in FCC 47 CFR Part 2(2.1091) and ANSI/IEEE C95.1-1992. The test results in this report apply only to the tested sample of the stated device/equipment. Other similar device/equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

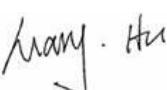
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### Date of Test

Date (s) of performance of tests..... : Aug. 11, 2024 ~ Oct. 08, 2024

Date of Issue ..... : Oct. 09, 2024

Test Result ..... : **Pass**

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## ※※ Revision History ※※

REV.	DESCRIPTION	ISSUED DATE	REMARK
Rev.1.0	Initial Test Report Release	Oct. 09, 2024	Mary Hu

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## 1 General Information

### 1.1 RF Exposure Requirements

#### 1.1.1 RF Exposure Limits

**Table - Limits For Maximum Permissible Exposure (MPE)**

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f <sup>2</sup>	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f <sup>2</sup>	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz \* = Plane-wave equivalent power density

A rough estimation of the expected exposure in power flux density on a given point can be made with the following equation:

$$S = \frac{P_t * G_t}{4 * \pi * R^2}$$

Where:

S = Power density (mW/cm<sup>2</sup>)

P<sub>t</sub> = Conducted output power (dBm)

G<sub>t</sub> = numeric gain of the antenna in the direction of interest relative to an isotropic radiator (dBi)

R= distance to the centre of radiation of the antenna (cm)

EIRP = P<sub>t</sub> \* G<sub>t</sub>

The antenna of the product, under normal use condition is at least 20 cm away from the body of the user. Warning statement to the user for keeping at least 20cm separation distance and the prohibition of operating to a person has been printed on the user's manual. Therefore, the S of the device is calculated with R=20cm, and if it is below the limit S, then we can conclude the device complies with the rules.

### 1.1.2 Additional Description

An estimation of MPE in this application for product is used to ensure if it complies to the rules of the standard in the regulation list above.

Maximum permissible exposure (MPE) refers to the RF energy that is acceptable for human exposure. It is broken down into two categories, Occupational/controlled and General population/uncontrolled.

Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

We analysis if it comply with the limits for General population/uncontrolled exposure. The FCC's MPE limits for field strength and power density are given in 47CFR 1.1310(Table below).These limits are generally based on recommended exposure guidelines published by the National Council on Radiation Protection and Measurements (NCRP), and also partly based on guidelines recommended by the American National Standards Institute (ANSI) in Section 4.1 of ANSI/IEEE C95.1.

## 1.2 EUT Description

Device Information	
Product Name	ConBox2020RD
Trade Name	Lear
Model Name	CB20RDNAR1
Serial Model	N/A
FCC ID	2BK8UCB20RDNAR1
Device Phase	Identical Prototype
Exposure Category	General population / Uncontrolled environment
Antenna Description:	<p>TX/PRX External Antenna 1(4K0.035.503.D):            GSM850: 4.9dBi; GSM1900: 6dBi; WCDMA Band II: 6dBi; WCDMA Band IV: 6dBi; WCDMA Band V: 4.9dBi;            LTE Band 2: 6dBi; LTE Band 4: 6dBi; LTE Band 5: 4.9dBi; LTE Band 7: 7.8dBi; LTE Band 12: 4.9dBi; LTE Band 13: 4.9dBi; LTE Band 14: 4.9dBi; LTE Band 17: 4.9dBi; LTE Band 25: 6dBi; LTE Band 26: 4.9dBi; LTE Band 41: 7.8dBi; LTE Band 66: 6dBi; LTE Band 71: 2.8dBi;            NR Band 2: 6dBi; NR Band 5: 4.9dBi; NR Band 7: 7.8dBi; NR Band 41: 7.8dBi; NR Band 66: 6dBi; NR Band 71: 2.8dBi; NR Band 77: 8.2dBi; NR Band 78: 8.2dBi;</p> <p>TX/RX Internal Antenna(WAG-M-LTE10-00-007-B):            GSM850: 4.9dBi; GSM1900: 6dBi; WCDMA Band II: 6dBi; WCDMA Band IV: 6dBi; WCDMA Band V: 4.9dBi;            LTE Band 2: 4.69dBi; LTE Band 4: 5.25dBi; LTE Band 5: -0.66dBi; LTE Band 7: 3.49dBi; LTE Band 12: -1.99dBi; LTE Band 13: -0.88dBi; LTE Band 14: -0.76dBi; LTE Band 17: -1.99dBi; LTE Band 25: 4.69dBi; LTE Band 26: -0.66dBi; LTE Band 41: 4.35dBi; LTE Band 66: 5.25dBi; LTE Band 71: -3.41dBi;            External Antenna (4N0.035.500) Ant1: 5G: 2.38dBi; 2.4G: 0.11dBi            External Antenna (5B4.035.510) Ant2: 5G: 5dBi; 2.4G: 3dBi</p>

## Device Operating Configurations

Supporting Mode(s)	GSM 850/1900, WCDMA Band II/IV/V, LTE Band 2/4/5/7/12/13/14/17/25/26/41/66/71, NR Band 2/5/7/41/66/71/77/78, WLAN 2.4G/5G, BT	
	EN-DC	
	NR	LTE
	n2	B5, B13, B71
	n5	B66
	n7	B5, B12
	n41	B5, B26, B71
	n66	B5, B12, B13
	n71	B2, B7, B66
	n77	B5, B13

	n78	B7, B12, B71
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### 1.3 Test specification(s)

FCC 47 CFR Part 1(1.1310)
FCC 47 CFR Part 2(2.1091)
FCC 47 CFR Part 2(2.1093)
KDB 447498 D01 General RF Exposure Guidance

### 1.4 Ambient Condition

Ambient temperature	20°C – 24°C
Relative Humidity	30% – 70%

## 1.5 Power Results

TX/PRX External Antenna 1(4K0.035.503.D) for 2G/3G/4G/5G

Mode	ERP (dBm) Max.	EIRP (dBm) Max.	Max. EIRP including tune-up (dBm)
GSM850	30.8	32.95	33.0
GSM1900	/	26.7	27.0
WCDMA Band II	/	22.9	23.0
WCDMA Band IV	/	22.8	23.0
WCDMA Band V	22.4	24.55	25.0
LTE Band 2	/	26.0	27.0
LTE Band 4	/	27.8	28.0
LTE Band 5	25.4	27.55	28.0
LTE Band 7	/	28.0	29.0
LTE Band 12	25.7	27.85	28.0
LTE Band 13	24.8	26.95	27.0
LTE Band 14	24.2	26.35	27.0
LTE Band 17	24.8	26.95	27.0
LTE Band 25	/	25.8	26.0
LTE Band 26 (814MHz ~ 824MHz)	23.9	26.05	27.0
LTE Band 26 (824MHz ~ 849MHz)	25.2	27.35	28.0
LTE Band 41	/	27.1	28.0
LTE Band 66	/	27.8	28.0
LTE Band 71	24.7	26.85	27.0
NR Band 2	/	26.7	27.0
NR Band 5	25.9	28.05	29.0

NR Band 7	/	27.5	28.0
NR Band 41	/	27.2	28.0
NR Band 66	/	27.0	28.0
NR Band 71	25.4	27.55	28.0
NR Band 77, 78 (3450MHz ~ 3550MHz)	/	25.5	26.0
NR Band 77 (3700MHz ~ 3980MHz)	/	25.1	26.0

Note: EIRP=ERP+2.15

External Antenna (4N0.035.500) for BT/5GWIFI

Mode	Conducted Power Target Value (dBm) Max.	Power tolerance (dB)	Max. Conducted power including tune-up (dBm)
BT	11.0	1.0	12.0
WIFI 5.2G	18.0	2.0	20.0
WIFI 5.8G	18.0	2.0	20.0

External Antenna (5B4.035.510) for 2.4GWIFI/5GWIFI

Mode	Conducted Power Target Value (dBm) Max.	Power tolerance (dB)	Max. Conducted power including tune-up (dBm)
WIFI 2.4G	21.0	2.0	23.0
WIFI 5.2G	18.0	2.0	20.0
WIFI 5.8G	18.0	2.0	20.0

## 2 RF Exposure Evaluation

TX/PRX External Antenna 1(4K0.035.503.D) for 2G/3G/4G/5G

Mode	Max. EIRP including tune-up (dBm)	R(cm)	S (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	MPE	Result
					Ratio	
GSM850	33	25	0.2542	0.549	0.463	Pass
GSM1900	27	25	0.0638	1	0.064	Pass
WCDMA Band II	23	25	0.0254	1	0.025	Pass
WCDMA Band IV	23	25	0.0254	1	0.025	Pass
WCDMA Band V	25	25	0.0403	0.55	0.073	Pass
LTE Band 2	27	25	0.0638	1	0.064	Pass
LTE Band 4	28	25	0.0804	1	0.080	Pass
LTE Band 5	28	25	0.0804	0.549	0.146	Pass
LTE Band 7	29	25	0.1012	1	0.101	Pass
LTE Band 12	28	25	0.0804	0.466	0.172	Pass
LTE Band 13	27	25	0.0638	0.519	0.123	Pass
LTE Band 14	27	25	0.0638	0.527	0.121	Pass
LTE Band 17	27	25	0.0638	0.471	0.136	Pass
LTE Band 25	26	25	0.0507	1	0.051	Pass
LTE Band 26 (814MHz ~ 824MHz)	27	25	0.0638	0.543	0.118	Pass
LTE Band 26 (824MHz ~ 849MHz)	28	25	0.0804	0.549	0.146	Pass
LTE Band 41	28	25	0.0804	1	0.080	Pass
LTE Band 66	28	25	0.0804	1	0.080	Pass
LTE Band 71	27	25	0.0638	0.443	0.144	Pass

NR Band 2	27	25	0.0638	1	0.064	Pass
NR Band 5	29	25	0.1012	0.549	0.184	Pass
NR Band 7	28	25	0.0804	1	0.080	Pass
NR Band 41	28	25	0.0804	1	0.080	Pass
NR Band 66	28	25	0.0804	1	0.080	Pass
NR Band 71	28	25	0.0804	0.443	0.181	Pass
NR Band 77, 78 (3450MHz ~ 3550MHz)	26	25	0.0507	1	0.051	Pass
NR Band 77 (3700MHz ~ 3980MHz)	26	25	0.0507	1	0.051	Pass

Note: Minimum distance of 25cm is declared by the applicant.

#### External Antenna (4N0.035.500) for BT/5GWIFI

Mode	Max. Conducted power including tune-up (dBm)	Antenna Gain (dBi)	R(cm)	S (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	MPE Ratio	Result
BT	12.0	0.11	27	0.0018	1	0.0018	Pass
WIFI 5.2G	20.0	2.38	27	0.0189	1	0.0189	Pass
WIFI 5.8G	20.0	2.38	27	0.0189	1	0.0189	Pass

Note: Minimum distance of 27cm is declared by the applicant.

#### External Antenna (5B4.035.510) for 2.4GWIFI/5GWIFI

Mode	Max. Conducted power including tune-up (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	R(cm)	SAR Exclusion threshold (mW)	SAR test exclusion	Estimated SAR (W/kg)	SAR Limit (W/kg)	SAR Ratio
WIFI 2.4G	23.0	3	26	398.107	14	996	YES	0.4	1.6	0.25
WIFI 5.2G	20.0	5	25	316.228	14	966	YES	0.4	1.6	0.25
WIFI 5.8G	20.0	5	25	316.228	14	962	YES	0.4	1.6	0.25

Note: Minimum distance of 14cm is declared by the applicant.

### 3 Exposure calculations for multiple sources

When a number of sources at different frequencies, and/or broadband sources, contribute to the total exposure, it becomes necessary to weigh each contribution relative to the MPE in accordance with the provisions of Table (A) and Table (B). To comply with the MPE, the fraction of the MPE in terms of  $E^2$ ,  $H^2$  (or power density) incurred within each frequency interval should be determined and the sum of all such fractions should not exceed unity.

In order to ensure compliance with the MPE for a controlled environment, the sum of the ratios of the power density to the corresponding MPE should not exceed unity. That is

$$\sum_{i=1}^n \frac{S_i}{MPE_i}$$

The product also has multiple transmitters. The Simultaneous Transmission Possibilities are as below:

Simultaneous Tx Combination	Configuration
1	GSM/WCDMA/LTE/NR+WLAN 2.4G
2	GSM/WCDMA/LTE/NR+BT
3	GSM/WCDMA/LTE/NR+WLAN 5G
4	NR NSA EN-DC
5	WLAN 5G MIMO
6	GSM/WCDMA/LTE/NR+WLAN 5G+BT
7	NR NSA EN-DC+WLAN 5G+BT

MPE Ratio at 4K0.035.503.D	MPE Ratio at 4N0.035.500	SAR Ratio at 5B4.035.510	Sum of ratios	Limit
0.463	0.0189	0.25	0.7319	<1

According to the Table above, we can conclude that the calculation results of all simultaneous transmission possibilities are less than 1, so it is into compliance.

Therefore the product also meets the requirements under multiple sources condition.

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